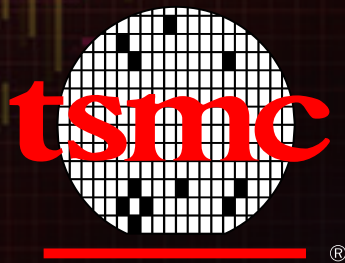


More Than Moore: A multi-die Touch Controller implementation

Synaptics



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ABSTRACT

Touch has become an integral part in human-machine interaction, from the ubiquitous touch pad in laptops to being the primary method of interfacing with a smart phone or tablet. Currently most touch sensors are based on capacitive sensing technology. Synaptics has been the leader for many years in providing leading edge touch controller solutions for products ranging from smartphones to tablets to automotive. Capacitive sensing requires detecting minute changes in the capacitance in the sensor array based on the presence of fingers. The detection has to work reliably in presence of various system level noise sources present in the phone such as display and charger noise as well as through other impairment such as moisture and glove. In order to provide that robustness, a capacitive touch controller requires highly specialized analog circuits with excellent SNR (signal-to-noise ratio) performance as well as significant computation power to detect multiple fingers in presence of noise and other impairments. The stringent demand on the analog and digital performance makes it difficult to design an optimal solution in a single technology node. Higher technology nodes with high voltage and low-noise transistors are optimal for analog performance and low cost, whereas digital computational logic, CPU and memory are more efficiently implemented in a lower technology node. To get the benefit of different technology nodes, Synaptics has implemented a family of touch controller using a 2-die MCM solution. The die with the analog front end is implemented in 180nm and the die with the computational logic including a proprietary CPU and memory is implemented in 55nm. This paper presents some of the challenges in the architecture, implementation and test of such a 2-die touch controller solution and the approach taken by Synaptics to overcome those.